

## 19. Visualising Shapes

### Exercise 19.1

#### 1. Question

What is the least number of planes that can enclose a solid? What is the name of the solid?

#### Answer

Four planes are required to enclose a solid.

The name of solid is tetrahedron.

#### 2. Question

Can a polyhedron have for its faces?

(i) 3 triangles?

(ii) 4 triangles?

(iii) a square and four triangles?

#### Answer

(i) 3 triangles?

No, Because a polyhedron is a solid shape bounded by polygons.

(ii) 4 triangles?

Yes, Because four triangles will form a tetrahedron, which is a polygon.

(iii) a square and four triangles?

Yes, because a square pyramid has a square and four triangles as its faces. Since pyramid is a polyhedron whose base is a polygon of any number of sides and whose other faces are triangles with common vertex.

#### 3. Question

Is it possible to have a polyhedron with any given number of faces?

#### Answer

Yes, if number of faces is four or more.

For example pyramid is a polyhedron whose base is a polygon of any number of sides and whose other faces are triangles with common vertex.

#### 4. Question

Is a square prism same as a cube?

## Answer

Yes, a square is a three dimensional shape with six rectangular shaped sides, at least two of which are squares. Cubes are rectangular prisms length, width and height of same measurement.

## 5. Question

Can a polyhedron have 10 faces, 20 edges and 15 vertices?

## Answer

No,

Using Euler's formula

$$V + F = E + 2$$

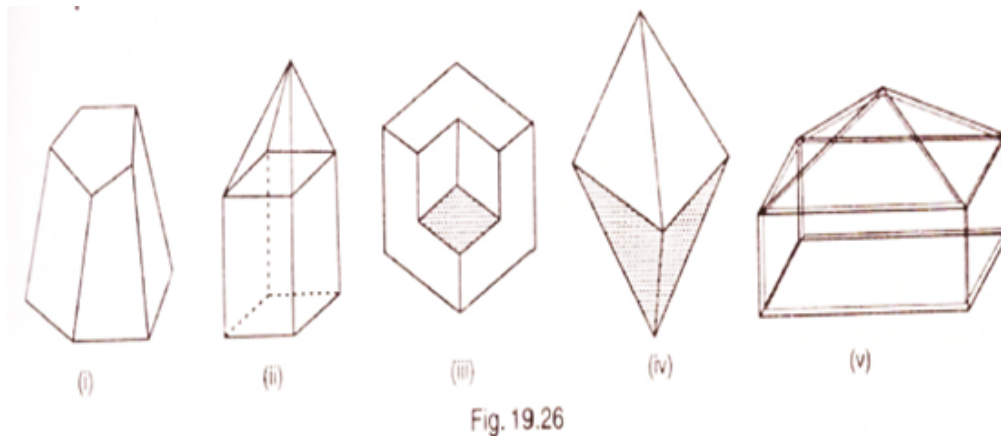
$$15 + 10 = 20 + 2$$

$$25 \neq 22$$

Since the given polyhedron is not following Euler's formula, therefore its not possible.

## 6. Question

Verify Euler's formula for each of the following polyhedrons:



## Answer

(i) Vertices = 10

Faces = 7

Edges = 15

$$V + F = E + 2$$

$$10 + 7 = 15 + 2$$

$$17 = 17$$

(ii) Vertices = 9

Faces = 9

Edges = 16

$$V + F = E + 2$$

$$9 + 9 = 16 + 2$$

$$18 = 18$$

$$(iii) \text{ Vertices} = 14$$

$$\text{Faces} = 8$$

$$\text{Edges} = 20$$

$$V + F = E + 2$$

$$14 + 8 = 20 + 2$$

$$22 = 22$$

$$(iv) \text{ Vertices} = 6$$

$$\text{Faces} = 8$$

$$\text{Edges} = 12$$

$$V + F = E + 2$$

$$6 + 8 = 12 + 2$$

$$14 = 14$$

$$(v) \text{ Vertices} = 9$$

$$\text{Faces} = 9$$

$$\text{Edges} = 16$$

$$V + F = E + 2$$

$$9 + 9 = 16 + 2$$

$$18 = 18$$

## 7. Question

Using Euler's formula find the unknown:

|          |    |   |    |
|----------|----|---|----|
| Faces    | ?  | 5 | 20 |
| Vertices | 6  | ? | 12 |
| Edges    | 12 | 9 | ?  |

### Answer

$$(i) V + F = E + 2$$

$$6 + F = 12 + 2$$

$$F = 14 - 6$$

$$F = 8$$

Therefore number of faces are 8

$$(ii) V + F = E + 2$$

$$V + 5 = 9 + 2$$

$$V = 11 - 5$$

$$V = 6$$

Therefore number of vertices are 6

$$(iii) V + F = E + 2$$

$$12 + 20 = E + 2$$

$$E = 32 - 2$$

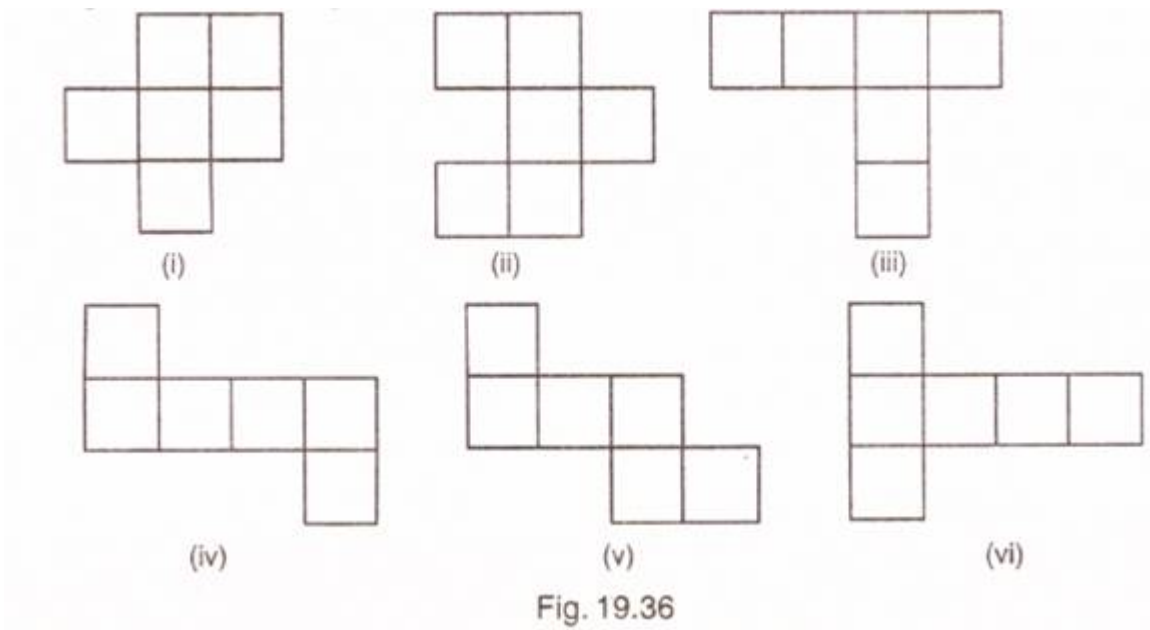
$$E = 30$$

Therefore number of edges are 30

## Exercise 19.2

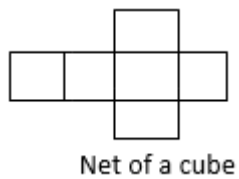
### 1. Question

Which among of the following are nets for a cube?



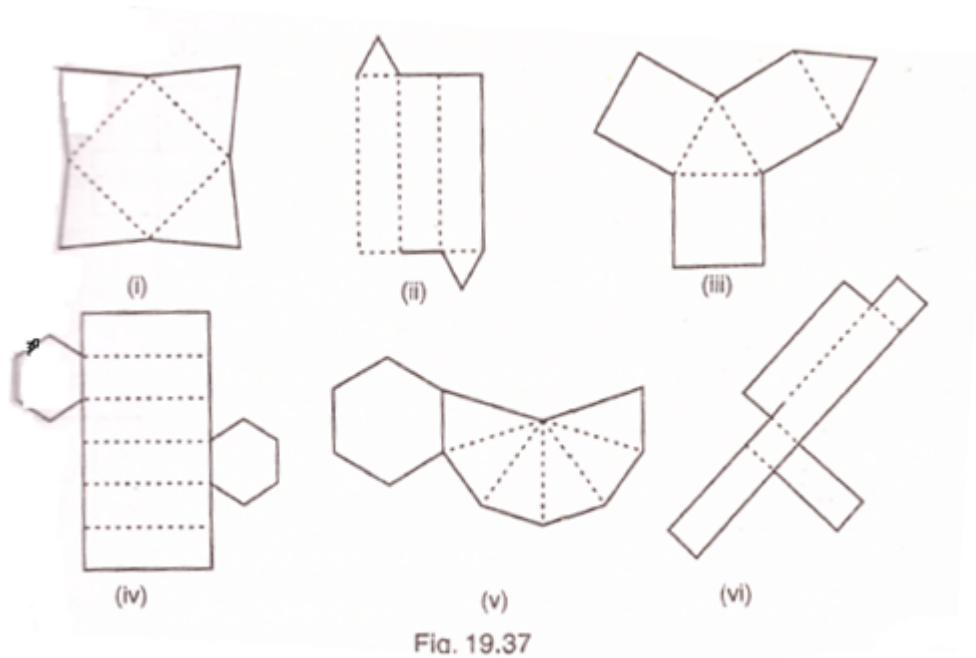
### Answer

Figure (iii) and (vi) are the nets of a cube.



### 2. Question

Name the polyhedron that can be made by folding each net:

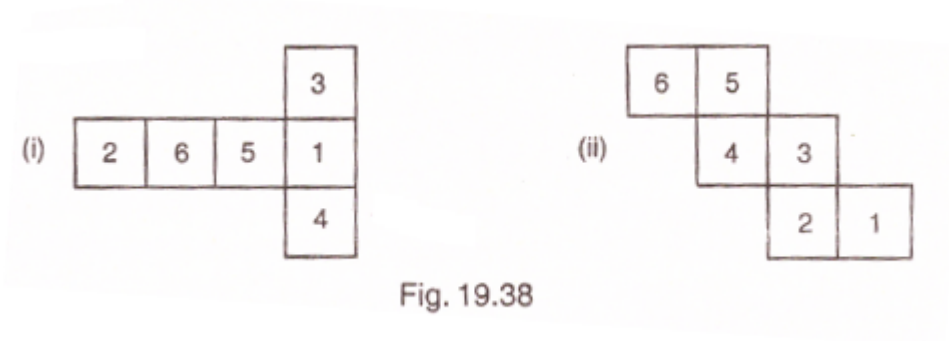


### Answer

- (i) From first figure Square pyramid can be made
- (ii) From second figure Triangular prism can be made
- (iii) From third figure Triangular prism can be made
- (iv) From fourth figure Hexagonal prism can be made
- (iv) From fifth figure Hexagonal pyramid can be made
- (v) From fifth figure Cube can be made

### 3. Question

Dice are cubes where the numbers on the opposite faces must total 7. Which of the following are dice?

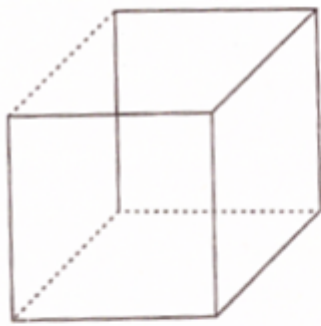


### Answer

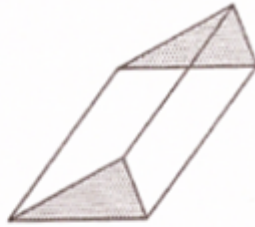
Fig (i) is a dice because the sum of numbers on opposite faces is 7 ( $3 + 4 = 7$  and  $6 + 1 = 7$ ).

### 4. Question

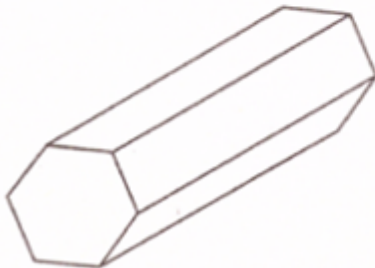
Draw nets for each of the following polyhedrons:



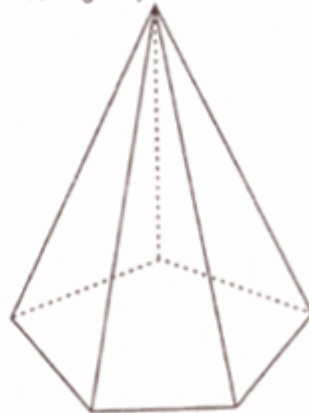
A cube



A triangular prism



A hexagonal prism



A pentagonal pyramid

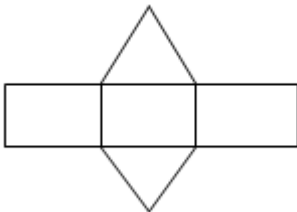
Fig. 19.39

## Answer

(i) Net pattern of a cube:



(ii) Net pattern of Triangular prism:

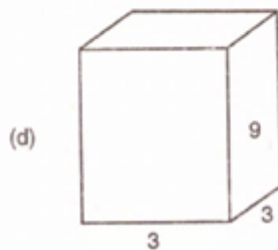
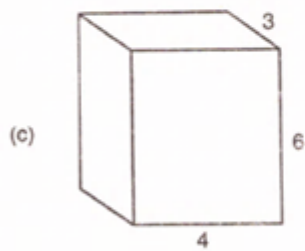
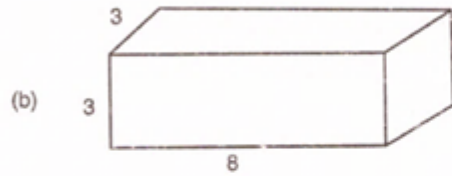
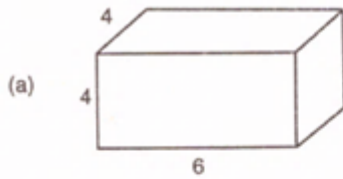


(iii) Net pattern of Hexagonal prism:

## 5. Question

Match the following figures:

## Prisms



## Nets with areas of faces

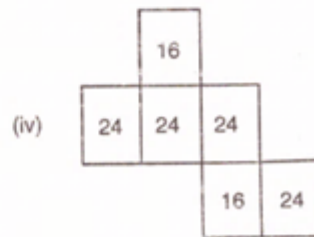
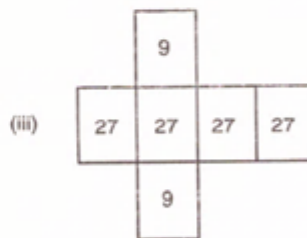
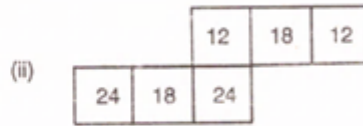
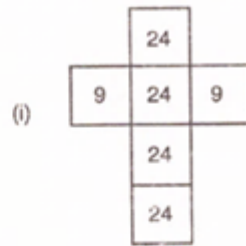


Fig. 19.40

## Answer

(a)—(iv) Because multiplication of numbers on adjacent faces are equal, i.e.  $6 \times 4 = 24$  and  $4 \times 4 = 16$

(b)—(i) Because multiplication of numbers on adjacent faces are equal, i.e.  $3 \times 3 = 9$  and  $8 \times 3 = 24$

(c)—(ii) Because multiplication of numbers on adjacent faces are equal, i.e.  $6 \times 4 = 24$  and  $6 \times 3 = 18$

(d)—(iii) Because multiplication of numbers on adjacent faces are equal, i.e.  $3 \times 3 = 9$  and  $3 \times 9 = 27$